



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : LIAO et al. Confirmation No: 2784
Appl. No. : 09/917,751
Filed : July 31, 2001
Title : NOVEL CYANINE-TCNQ DYE FOR HIGH DENSITY DATA
STORAGE MEDIA

TC/A.U. : 1756
Examiner : M. Angebranndt

Docket No.: : LIAO3030/REF
Customer No: : 23364

APPEAL BRIEF 37 CFR §41.37

MAIL STOP APPEAL BRIEF

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This brief on appeal is submitted along with the required fee of \$340. A petition for a two month extension of time and the appropriate fee is submitted herewith extending the period for filing the brief to November 29, 2004. The brief is timely filed.

Any addition fees necessary for this appeal may be charged against the undersigned's Deposit Account No. 02-0200.

(c)(1)(i). REAL PARTY IN INTEREST

The real party in interest is the Assignees of record, National Technology Research Institute and National Tsing-Hua University.

(c)(1)(ii). RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences with respect to the claimed invention which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal known to appellant, appellant's legal representative or assignee.

(c)(1)(iii). STATUS OF CLAIMS

This application contains 49 claims. Claims 1-29 have been canceled from the application. Claims 30-49 are pending, are finally rejected and are the claims on appeal.

(c)(1)(iv). STATUS OF AMENDMENTS

The amendment after Final Rejection filed on June 28, 2004, has been entered for the purpose of this appeal as indicated in the Advisory Action of July 20, 2004. In view of this amendment the rejections under 35 USC 112 have been withdrawn as stated in the Advisory Action.

(c)(1)(v). SUMMARY OF CLAIMED SUBJECT MATTER

This invention relates to cyanine-TCNQ complex dyes mixture (II, III, and IV) used as a data storage media, having an extremely large absorption and high fluorescent quantum efficiency in the visible light region with $\lambda = 400\text{nm}$ to about 800nm , and can be used for the recording layer material of the reflection optical at recording media and the non-reflective fluorescent optical recording media after suitable formulation. (Page 1, lines 5-11.)

The other aim of this invention is to provide a cyanine-TCNQ complex dyes mixture (II, III, and IV), used for the data storage media, in which it is not necessary to add any photostabilizing agent since these dyes possess excellent photostability. The change of reflection index for an optical disc with wavelength at 635nm is smaller than 1%. (Page 4, lines 1-8.)

The invention is to bond the TCNQ molecule on cyanine dye to form a stable charge transfer complex. It has good absorption both in the UV light region and in the near infrared light region and it will remove the shortwave light resource which possesses the ability to break the chemical bonding, through the charge transfer and irradiation of fluorescent light pathways to transfer the energy. In addition, since the cyanine TCNQ charge transfer complex possesses the higher oxidation potential than that of the general cyanine halide, cyanine ClO_4 , for a cyanine PF_6 complex, the TCNQ of the present invention possesses the better inhibition of singlet oxygen attacking the main part of the cyanine dye and it increases the photostability of the cyanine dye to overcome the problem of addition of photostabilizing agent. (Page 8, lines 5-20.)

(c)(1)(vi). GROUND OF REJECTION TO BE REVIEWED ON APPEAL

The rejection of claims 30-49 under 35 U.S.C. 103(a) as unpatentable over Liao et al. combined with Cho et al. and Sato et al. is to be reviewed on this appeal.

The rejection of claims 30-49 under 35 U.S.C. 103(a) as unpatentable over Liao et al. ('087, combined with Cho et al. and Sato et al.) and further in view of Ishida et al. is also to be reviewed on this appeal.

(c)(1)(Vii). ARGUMENT

The issue involved in all of the rejections on appeal is whether or not the claimed subject matter is prima facie obvious to one of ordinary skill in the art to which the invention pertains, at the time of the invention. This requires an interpretation of the prior art as a whole at the time of the invention. Basically, it is Applicants' position that the prior art has been improperly interpreted relying on Applicants' specification. That is, the rejections are based on improper hindsight.

In this regard, Applicants wish to direct the Board's attention to the decision of the CAFC In re Demibiczak, 50 USPQ2d 1614. Applicants believe that the present rejections do not establish that the claimed invention is prima facie obvious. The following is from the decision, pages 1616 -1618.

Our analysis begins in the text of section 103 quoted above, with the phrase "at the time the invention was made." For it is this phrase that guards against entry into the "tempting but forbidden zone of hindsight," see *Loctite Corp. v. Ultraseal Ltd.*, 781 F.2d 861, 873, 228 USPQ 90, 98 (Fed. Cir. 1985), overruled on other grounds by *Nobelpharma AB v. Implant Innovations, Inc.*, 141 F.3d 1059, 46 USPQ2d 1097 (Fed. Cir. 1998), when analyzing the patentability of claims pursuant to that section. Measuring a claimed invention against the standard established by section 103 requires the oft-difficult but critical step of casting the mind back to the time of invention, to consider the thinking of one of ordinary skill in the art, guided only by the prior art references and the then-accepted wisdom in the field. See, e.g., *W.L. Gore & Assoc., Inc. v. Garlock, Inc.*, 721 F.2d 1540, 1553, 220 USPQ 303, 313 (Fed. Cir. 1983).

See also MPEP §2141.02 Differences Between Prior Art and Claimed Invention -

A prior art reference must be considered in its entirety, i.e., as a whole, including portions that would lead away from the claimed invention. *W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984) (Claims were directed to a process of producing a porous article by expanding shaped, unsintered, highly crystalline poly(tetrafluoroethylene) (PTFE) by stretching said PTFE at a 10% per second

rate to more than five times the original length. The prior art teachings with regard to unsintered PTFE indicated the material does not respond to conventional plastics processing, and the material should be stretched slowly. A reference teaching rapid stretching of conventional plastic polypropylene with reduced crystallinity combined with a reference teaching stretching unsintered PTFE would not suggest rapid stretching of highly crystalline PTFE, in light of the disclosures in the art that teach away from the invention, i.e., that the conventional polypropylene should have reduced crystallinity before stretching, and that PTFE should be stretched slowly.).

Applying the above judicial standards to the outstanding rejections, Applicants most respectfully submit that the rejections do not establish a prima facie case of obviousness of the claimed subject matter and should be reversed.

The rejection of claims 30-49 under 35 U.S.C. 103(a) as unpatentable over Liao et al. combined with Cho et al. and Sato et al.

The rejection of claims 30-49 under 35 U.S.C. 103(a) as unpatentable over Liao et al. combined with Cho et al. and Sato et al. should be reversed for the following reasons.

Applicants basically concur with the statements in the Final Rejection concerning the teachings of the Liao et al. '087 reference. As stated at column 2 line 3 of the patent, the formula of the cyanine dye of the invention is shown as a structural formula (I). The only variable in this formula is the value of n which represents an integer of 1 and 2. The R substituents substituted on the ring nitrogen atom are identical. Thus, it would be appreciated by one of ordinary skill in the art that the R substituents must be identical and this is necessary to obtain the results of the invention. There is absolutely no suggestion or motivation in this reference to suggest the modification of the R substituents with the expectation of obtaining the results achieved in the Liao et al. reference much less the improvements obtained by the presently claimed invention. Such a modification is contrary to the clear teaching of the reference as it would be interpreted by one of ordinary skill in the art.

The counterion, X^- , for these cyanine dyes is generically defined in the reference as an acid anion.

The teachings of the secondary reference to Cho et al. which includes as counterions TCNQ has been carefully considered. The counterion set forth in the primary Liao et al reference, X^- , represents an acid anion which is preferably a halogen anion, alkylsulfate anion, arylsulfonate anion or a perchlorate anion to provide a cyanine which is thermally stable and soluble in various organic solvents. The Cho et al. reference relates to an optical recording medium comprising a TCNQ charge transfer complex having an organic electron donor form from a cyanine-based dye shown by formula (I). When the optical recording medium is irradiated with a laser beam, the cyanine-TCNQ in the recording layer absorbs the laser beam and is melted or decomposed thus recording information. Reproduction can be accomplished by reading the reflectivity difference between the recording portion and the non-recording portion with lower power than the recording laser.

In the formula (I) of Cho et al., R represents a heteroaromatic residue and R' represents alkyl; n represents a positive integer not less than 2. Clearly, one of ordinary skill in the art would appreciate the unequivocal teaching in Cho et al that n must be at least 2 and R' alkyl. Therefore, one of ordinary skill in the art would not combine the teachings of Liao et al and Cho et al to arrive at the presently claimed data storage media as the necessary motivation to make the modifications to the structural formula is not present, other than in applicants' specification which may not be used as a teaching reference. Clearly, Liao et al. states that the R substituents must be identical and are each a 4-methoxycarbonylbenzyl group. One of ordinary skill in the art would appreciate this teaching and understand that they may not be alkyl. That is both are required to be 4-methoxycarbonylbenzyl to obtain the results of the invention. Cho et al on the contrary, teach that the corresponding substituent both are alkyl and n must be 2.

The claims on appeal require a mixture of two dye complexes in which one dye complex has a corresponding value of R substituents as a combination of a 4-methoxycarbonylbenzyl and alkyl with a value of n as 1. There is no way that this combination may be obtained from the prior art without using Applicants's specification as prior art. In re Fritch, 23 USPQ 1780, 1784(Fed Cir. 1992) ("It is impermissible to engage in hindsight reconstruction of the claimed invention, using the applicant's structure as a template and selecting elements from references to fill the gaps.).

In addition, the requirement in Cho is that n represents a positive integer which is not less than 2. This does not include the trimethine compound of formula II in the data storage media of the claims on appeal. This is a claim limitation which cannot be ignored. There is simply no motivation to combine the references and arrive at the presently claimed invention when the teachings of the references are considered in their entirety and as would be interpreted by one of ordinary skill in the art to which the invention pertains.

In the Final Rejection it is urged that the Sato et al. reference '839 teaches that unsymmetrical indoleneic cyanine dyes have higher solubility and stability. Reference is made to the abstract. It is further urged that indoleneic and benzoindolenic dyes are described throughout. The structural formulas for the compounds (I) and (II) described in the reference are set forth in column 2. As would be evident to one of ordinary skill in the art, none of the various R substituents on the compounds may be 4-methoxybenzyl and the specific anion of the compounds used in the data storage media of the claims on appeal is not suggested. Again, it is only with impermissible hindsight relying on Applicants' teaching that the compounds of the present invention are obtained.

The addition of stabilizers is also disclosed by Sato et al. The addition of various materials to the recording layer is disclosed including polymeric binders, the polymeric binder is held to act as an adhesive/glue. However, none of these teachings overcome

the deficiencies of the combination of the primary and the secondary reference nor render obvious the presently claimed invention particularly in view of the unique results achieved by the present invention as is set forth in the exemplification in the present application.

Moreover, applicants wish to point out that the cyanine-TCNQ complex dyes disclosed and claimed in the present application had better photostability than the components disclosed in the Liao et al. '087 patent. The test data of the cyanine-TCNQ disclosed in the present application was reported in the attached article entitled "Quencher Free Optical Recording Materials: Photofading Experimental and Anti-Photofading Mechanism Studies". This is further evidence of the results achieved by the presently claimed invention.

For the above reasons, a combination of the Liao et al., Cho et al. and Sato et al. references as set forth in item 5 on page 3 of the Official Action do not render the presently claimed invention *prima facie* obvious since the necessary modifications are not found in the references and applicant's specification may not be used as a teaching reference to combine the references and obtain the presently claimed invention. This is especially true in view of the results achieved by the presently claimed invention already of record, as set forth in the specification and is attached hereto.

Applicants wish to note the background of inventor Liao for the Board of Appeals and Interferences. Inventor, Wen-Yih Liao who is a leader in the department of the data storage media technology, had worked in Industrial Technology Research Institute for 23 years and describes the conditions for experiments conducted and which it is believed establishes the patentability of the claimed invention as requested by the Examiner.

Condition for technology in the invention

1. The equipments are conventional.
2. The use of temperature as reference to experimentals at page 10~18 of description.
3. How to progress as following
mixing a cyanine-TCNQ dye and an appropriate solvent as a TFP applied on a disk with a weight percent of 1.5%~2.2% under the basis of solute/solution and then;
coating rotationally a mixture of the cyanine-TCNQ dye and the TFP on an unused plastic film by the use of an optical measurement system as ETA-RT (STEAG) to measure a wavelength on a plurality of refractive index as $n+ik$, wherein said the process respectably relates to a absorption of the dye
4. Relative to experimental data between prior art and the invention
Providing a comparison between prior art (Morishima et al.) and the invention following the sheet; and where k is an absorption coefficient:

TERM	$n+ik$ (658nm) of Dye-X (Prior Art)	$n+ik$ (658nm) of Dye-TCNQ (Invention)
L-type Cyanine	$2.383+0.047 i$ (S0363-CIO4)->benefit	$2.150+0.098 i$ (L-E03-TCNQ)->benefit
SL-type Cyanine	$2.104+0.015 i$ (SL-PF6)->benefit	$2.090+0.045 i$ (SL-TCNQ)->benefit
S-type Cyanine	$2.210+0.015 i$ (S-PF6)->benefit	$1.980+0.040 i$ (S-E03-TCNQ)->benefit

As a conclusion, with respect to the data combinations, a higher solubility of the invention with Cyanine dye-TCNQ complex is better then the Morishima's, which the solubility of the invention is 32 wt% and the solubility of the Morishima isn't higher 0.5 wt% and, could be equal to 0.5 wt%.

Note: Reference to experimental examples at page 10~18, of description, which had been stated the details.

In the Final Rejection, on page 5, it is urged that the Liao reference teaches mixtures of pentamethine and trimethine indolene cyanine dyes bearing methyl esters of 4-benzoic acid substituents in appropriate ratios for recording. It is then stated that

the use of the methyl ester 4-benzoic substituent is disclosed as resulting in gains in solubility and thermal stability. However, as previously noted by applicants, it is a requirement of the reference, as would be appreciated by one of ordinary skill in the art that both R substituents contain the 4-benzoic acid substituents and there is no suggestion to remove one of the substituents in accordance with the claims on appeal.

The statement that the Sato et al. reference teaches that changing one of the end substituents to make dyes less structurally similar is old and the resulting increase in solubility well known in the art. This is clearly hindsight reconstruction based upon applicant's specification. One of ordinary skill in the art would not interpret the references, in their entirety, to make the necessary selection to arrive at the presently claimed invention. Accordingly, it is most respectfully requested that this rejection be reversed on appeal.

Applicants note the examiner's comments with respect to the data present and believe that applicant's invention is clearly patentable in that a *prima facie* case of obviousness has not been established by the rejection for the above reasons. Clearly, the testing and information presented, including those in the attached Journal article must be taken into consideration and given some weight and clearly evidence the advantages of the presently claimed invention. Accordingly, it is most respectfully requested that this rejection be withdrawn or reversed on appeal.

The rejection of claims 39-40 under 35 U.S.C. § 103(a) being unpatentable over Liao et al. ('087, combined with Cho et al. and Sato et al.) and further in view of Ishida et al.

The rejection of claims 39-40 under 35 U.S.C. § 103(a) being unpatentable over Liao et al. ('087, combined with Cho et al. and Sato et al.) and further in view of Ishida et al. should also be reversed for the reasons discussed above.

The Ishida et al. reference is stated to teach the dyes of formula I mixed with TCNQ compounds A1 or A2. Specific reference in the Final Rejection is made to (2/27-35) presumably this refers to column 2, lines 25 to 35 which states that, "The inventors have found that the light-resistance of the optical information recording medium can be remarkably improved by using a combination of a specific anti-fading agent and a cyanine dye consisting of a polyvalent anion and two or more cyanine dye cations. Although the mechanism causing the above effect is not elucidated, it is assumed that the polyvalent anion make the dye anions work as counter ions to enhance electric or structural interaction between the dye and the anti-agent." The anion is defined as X^{-n} , where n is 2 or more. This is quite different from the statement in the Final Rejection, page 7, that, "The use of cyanine dye cations and TCNQ anions is disclosed as working best as would be appreciated by one of ordinary skill in the art to which the invention pertains. This statement is specifically traversed as it is clearly in error, at least so far as applicants can tell from a reading of the reference. It is most respectfully submitted it is only with the benefit of hindsight based on Applicants' teaching that such a conclusion can be reached.


It is also stated in the Final Rejection that the use of a recording layer having thickness of 50 to 300 nm is disclosed. The use of various metals such as the preferred gold, silver, aluminum, copper or chromium alloys is suggested. However, none of these teachings overcome the deficiencies in the initial combination of the references for the above reasons, it is most respectfully requested that this rejection be withdrawn or reversed on appeal.

IX. CONCLUSION

In view of the above arguments, the rejections of the claims on appeal should not be sustained. The prior art rejections should be reversed and the application passed to issue.

Respectfully submitted,

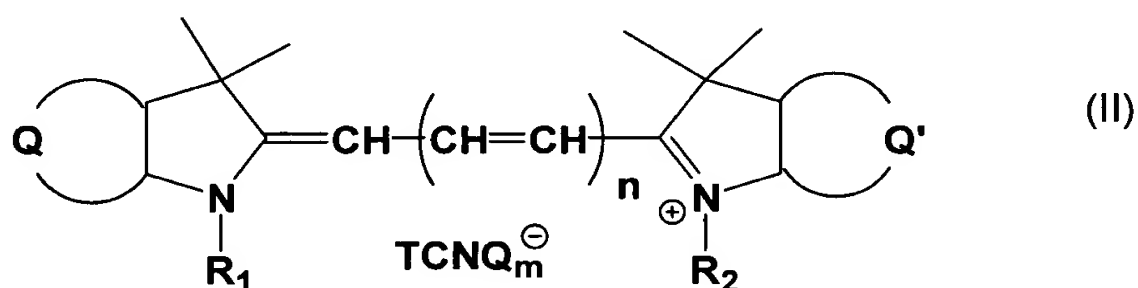
BACON & THOMAS, PLLC

By: 
Richard E. Fichter
Registration No. 26,382

625 Slaters Lane - 4th Fl.
Alexandria, Virginia 22314
Phone: (703) 683-0500
Facsimile: (703) 683-1080
REF:ref
LiaoBrief-1.wpd
November 26, 2004

(c)(1)(viii) Claims appendix

30. A data storage media including a substrate and a recording layer, said recording layer containing uniformly distributed in said layer a mixture of at least a first and second cyanine dye-TCNQ complex; said first cyanine dye-TCNQ complex having a formula (II):



wherein Q and Q' each form a six-membered carbon containing aromatic ring;

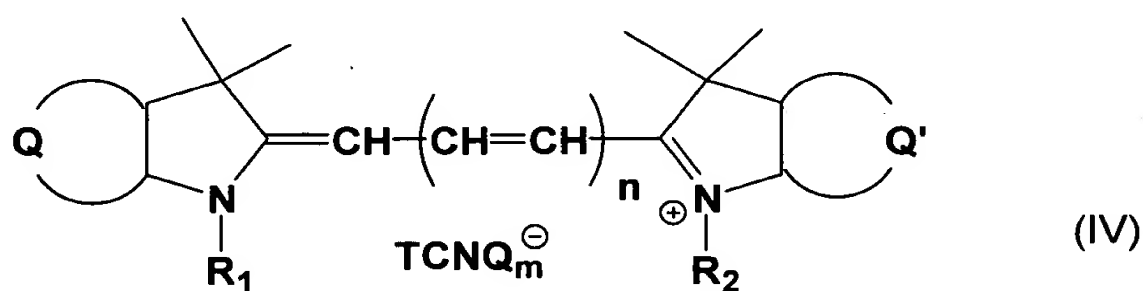
R₁ is -CH₂C₆H₄COOCH₃;

R₂ is a linear butyl group;

TCNQ is 7,7',8,8'-tetracyanoquinodimethane;

m and n are each 1; said second cyanine dye-TCNQ complex having a formula

(IV)



wherein Q and Q' each form a six membered carbon containing aromatic ring;
R₁ is -CH₂C₆H₄COOCH₃;
R₂ is CH₂C₆H₄COOCH₃;
n is an integer of 2;
m is 1; and the weight percentage of complex (IV) to complex (II) is from 0.5 to about 20%.

31. The data storage media of claim 30 also containing a reflection layer which is selected from the group consisting of Au, Ag, Al, Cu, Cr and alloys thereof.

32. The data storage media of claim 30 wherein the recording layer has a thickness of about 500 Å to about 2000 Å.

33. The reflection layer of claim 30 ~~30~~ 31 having a thickness of about 500 Å to about 1000 Å.

34. The data storage media of claim 30 which is a high density recordable optical disc.

35. The data storage media of claim 30 wherein the weight percentage of complex (IV) to complex (II) is from 2 to 10%.

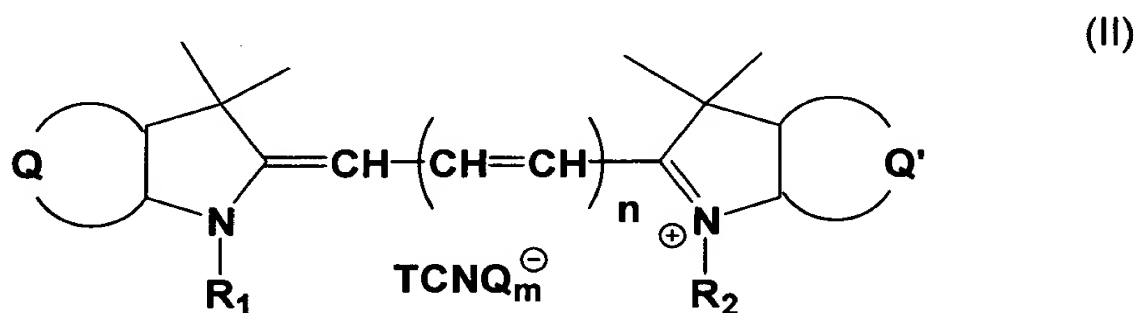
36. The data storage media of claim 35 also containing a reflection layer which is selected from the group consisting of Au, Ag, Al, Cu, Cr and alloys thereof.

37. The data storage media of claim 35 wherein the recording layer has a thickness of about 500 Å to about 2000 Å.

38. The reflection layer of claim 36 having a thickness of about 500 Å to about 1000 Å.

39. The data storage media of claim 35 which is a high density recordable optical disc.

40. A data storage media including a substrate and a recording layer, said recording layer containing uniformly distributed in said layer a mixture of at least a first and second cyanine dye-TCNQ complex; said first cyanine dye-TCNQ complex having a formula (II):



wherein Q and Q' each form a six-membered carbon containing aromatic ring;

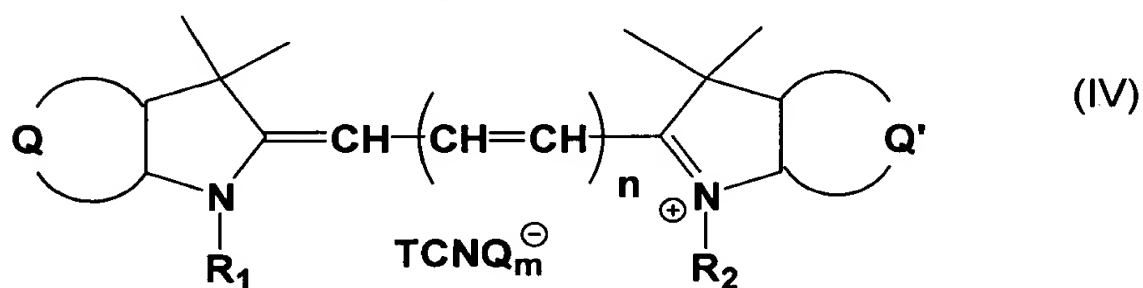
R₁ is -CH₂C₆H₄COOCH₃;

R₂ is an alkyl group;

TCNQ is 7,7',8,8'-tetracyanoquinodimethane;

m and n are each 1; said second cyanine dye-TCNQ complex having a formula

(IV)



wherein Q and Q' each form a six membered carbon containing aromatic ring;

R_1 is $-\text{CH}_2\text{C}_6\text{H}_4\text{COOCH}_3$;

R_2 is $\text{CH}_2\text{C}_6\text{H}_4\text{COOCH}_3$;

n is an integer of 2;

m is 1; and the weight percentage of complex (IV) to complex (II) is from 0.5 to about 20%.

41. The data storage media of claim 40 also containing a reflection layer which is selected from the group consisting of Au, Ag, Al, Cu, Cr and alloys thereof.

42. The data storage media of claim 40 wherein the recording layer has a thickness of about 500 Å to about 2000 Å.

43. The reflection layer of claim 41 having a thickness of about 500 Å to about 1000 Å.

44. The data storage media of claim 40 which is a high density recordable optical disc.

45. The data storage media of claim 40 wherein the weight percentage of complex (IV) to complex (II) is from 2 to 10%.

46. The data storage media of claim 45 also containing a reflection layer which is selected from the group consisting of Au, Ag, Al, Cu, Cr and alloys thereof.

47. The data storage media of claim 45 wherein the recording layer has a thickness of about 500 Å to about 2000 Å.

48. The reflection layer of claim 46 having a thickness of about 500 Å to about 1000 Å.

49. The data storage media of claim 45 which is a high density recordable optical disc.